

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today  
(1) was not written for publication in a law journal and  
(2) is not binding precedent of the Board.

Paper No. 17

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte FRED E. STANKE  
and RALPH M. D ANGELO

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Appeal No. 97-1628  
Application 08/442,610<sup>1</sup>

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ON BRIEF

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Before ABRAMS, FRANKFORT, and CRAWFORD, Administrative Patent Judges.

ABRAMS, Administrative Patent Judge.

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<sup>1</sup> Application for patent filed May 17, 1995. According to appellants, this application is a continuation of Application 08/206,687, filed March 4, 1994, now abandoned; which is a continuation of Application 08/018,642, filed February 17, 1993, now abandoned; which is a continuation-in-part of Application 07/810,772, filed December 17, 1991, now abandoned.

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### **DECISION ON APPEAL**

This is an appeal from the decision of the examiner finally rejecting claims 39-56, the amendment of which has been permitted subsequent to the final rejection. Claims 1-38 have been allowed.

The appellants' invention is directed to a method and apparatus for interrogating a cased borehole environment for the purpose of discovering the presence of flaws in the materials or the interface between the materials. The subject matter before us on appeal is illustrated by reference to claim 39, which has been reproduced in an appendix to the Brief.

### **THE REFERENCES**

The references relied upon by the examiner to support the final rejection are:

Vogel et al. (Vogel)	4,809,237	Feb. 28, 1989
Broding	5,001,676	Mar. 19, 1991

### **THE REJECTION**

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Claims 39-56 stand rejected under 35 U.S.C. § 103 as being unpatentable over Broding in view of Vogel.

The rejection is explained in the Examiner's Answer.

The viewpoints of the appellants are set forth in the Brief.

#### **OPINION**

The rejection has been made under 35 U.S.C. § 103, which means that the examiner bears the initial burden of presenting a *prima facie* case of obviousness (see *In re Rijckaert*, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993)), which is established when the teachings of the prior art itself would appear to have suggested the claimed subject matter to one of ordinary skill in the art (see *In re Bell*, 991 F.2d 781, 783, 26 USPQ2d 1529, 1531 (Fed. Cir. 1993)).

The present invention is directed to the problem of interrogating the interfaces between the various materials present in a well borehole by the use of ultrasonic energies to characterize the materials and the bonds formed between them (specification, page 1). As explained by the appellants,

typically, the casing is referred to as the first material, and an interface is formed between it and the second material, which is the cement that surrounds the casing. A third interface exists between the cement and the earth surrounding the borehole. Imperfect conditions, however, can cause other interfaces to be present, such as at voids in the cement (specification, page 2; Figure 1). The appellants admit that is has been known to utilize acoustic methods and apparatus to interrogate a cased borehole environment. However, the invention utilizes a system in which only "shear acoustic energy" is utilized beyond the casing. In this regard, we understand that there are two forms of acoustic energy that figure in this case. They are "shear" acoustic energy, in which the particle motion in the acoustic waves is perpendicular to the direction of wave travel, and "compressional" acoustic energy, in which the particle motion is in the direction of wave travel (see Vogel, column 1, lines 31-36).

All of the claims have been grouped together in the rejection. According to the examiner, in the Broding system shear energy propagated within the casing is reflected at the

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interface between the casing and the cement, which results in a compression wave component moving through the cement. It is this compression wave that is reflected back if it strikes an anomaly in the cement. The examiner finds on page 2 of the Answer that:

The difference between [the appellants'] claims . . . and the Broding system lies in the energy that is propagated in the cement (annulus between the casing and the formation). In the instant claims, shear acoustic energy is reflected from the "surface", received and therefore interpreted. In Broding, compressional acoustic energy is reflected at an anomaly (surface), received and thereafter interpreted (emphasis added).

The examiner goes on to take the position that Vogel teaches "that in cement bond studies shear wave measurements are preferable to compressional wave measurements" (Answer, page 2), from which the examiner concludes that it would have been obvious to one of ordinary skill in the art to modify Broding by replacing the compressional wave system with one using shear waves (Answer, page 3). The appellants dispute this conclusion, arguing that the examiner has erroneously interpreted the teachings of Vogel, that there would have been no suggestion to combine the teachings of the two references

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in the manner proposed, and that even if such were proper, the result would not be the claimed invention.

We will not sustain the rejection. Our reasons for arriving at this conclusion follow.

Broding, the primary reference, teaches interrogating the materials installed in the borehole, and does so by the use of a transducer that emits both shear waves and compression waves. Broding so positions the transducer as to insure that, while shear waves are present in the casing, they are converted to compression waves as they exit the casing and proceed into the next material. These waves are converted back to shear waves when they reenter the casing. In the Broding system it is only compressional waves that are the means for detecting anomalies outside of the casing. See column 2, line 44 *et seq.* and column 7, lines 5-26.

While set forth in different manners in the twelve independent claims before us, each of the appellants' claims requires that there be a shear portion of acoustic energy that is reflected from an interface of at least one material situated between the borehole casing and the formation in

which the borehole is located. As the examiner has acknowledged, Broding fails to disclose or teach this feature.

Vogel discloses a system for interrogating the borehole environment with acoustic waves. This reference discusses in the prior art section the actions of both shear and compressional acoustic waves. In a discussion of the prior art, Vogel points out that the propagation of "S-waves," which we presume to be "shear waves," is not supported by borehole fluid, and thus these waves cannot escape from the formation. Vogel explains that what happens is that the S-waves propagate through the sidewall material, mechanically exciting corresponding compressional waves in the fluid, and creating "converted-compressional" waves (column 1, line 53 *et seq.*). In accordance with the method of the Vogel invention, a logging tool having acoustic transmitter and receiver elements transverses the borehole and "[t]he receiver element detects converted-compressional waves emanating from the casing" (column 3, line 67 *et seq.*). This use of converted compressional waves is repeated with regard to two other aspects of the invention (column 4, lines 19 and 27).

Therefore, while shear waves appear to be generated in the Vogel system, they move along the length of the elements, such as is shown at 58 in Figure 3 (see column 6, line 31 *et seq.*), and do not reflect from the interfaces, as is required by the appellants' claims. Thus, even if the teachings of Vogel and Broding were combined, they would not, in our view, render the claimed subject matter obvious.

Moreover, we fail to discern any teaching or suggestion which would have motivated one of ordinary skill in the art to combine the references in the manner proposed by the examiner. It is an object of the Broding invention to solve problems present in the prior art by utilizing only compressional waves through and beyond the casing to interrogate the elements in the borehole; shear waves are converted to compressional waves (column 3, lines 1-15). As is made clear in column 7, in the Broding system the shear waves that are generated remain in the casing, while the compression waves travel into the surrounding elements. Therefore, replacing the compression waves in Broding with shear waves would subvert the Broding invention and act as a disincentive to the artisan to do so.



It is our conclusion that Broding and Vogel fail to establish a *prima facie* case of obviousness with regard to the subject matter recited in the appellants' claims, and therefore the rejection cannot be sustained.

**REMAND TO THE EXAMINER**

As explained in the specification, and with particular attention to Figure 3A, the appellants' invention comprises a transmitter and a receiver located within a steel casing 115, which is filled with fluid (drilling mud) 121. Cement 119 surrounds the casing, filling the space between the casing and the earth 117 in which the borehole is located. As shown in Figure 1, fluid anomalies also can exist within the cement, such as channels 129, 131, and 133. From the explanation beginning on page 7 of the specification, it would appear that in the process of interrogating the various substances and the interfaces therebetween, the shear energy components of the acoustic signal must travel through areas of fluid. This is carried forward in the claims, many of which require that shear acoustic energy be propagated "within the casing" and "beyond the casing" (i.e. claim 39), and some also require

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that the shear acoustic energy be received and interpreted (i.e., claim 43). Both instances would seem to require that shear waves propagate through fluid.

Presuming that the S-wave referred to in Vogel is the same as the shear wave of the appellants' invention, we draw attention to Vogel's comments that "S-waves cannot propagate through a fluid" (column 1, line 52), and "the S-wave as such cannot escape from the formation because the borehole fluid will not support S-wave propagation" (column 1, lines 61-63). This would seem to cast aspersions upon the operability of the appellants' invention. This application therefore is remanded to the examiner for consideration of this issue as it may affect the appellants' claims.

#### **SUMMARY**

The rejection is not sustained.

The decision of the examiner is reversed.

The application is remanded to the examiner for consideration of the matter raised immediately above.

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**REVERSED and REMANDED**

	Neal E. Abrams	)	
	Administrative Patent Judge	)	
		)	
		)	
		)	
	Charles E. Frankfort	)	BOARD OF
PATENT	Administrative Patent Judge	)	APPEALS AND
		)	INTERFERENCES
		)	
		)	
	Murriel E. Crawford	)	
	Administrative Patent Judge	)	

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